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Okabe

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(54) **IMAGE FORMING APPARATUS HAVING MOVABLE SUPPORTING MEMBER FOR SUPPORTING CARTRIDGE**

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G03G 21/18 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1871*** (2013.01); *G03G 2215/0141* (2013.01); *G03G 2221/1684* (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1871; G03G 2215/0141; G03G 2221/1684; G03G 15/0105; G03G 21/16; G03G 21/1604; G03G 21/1642; G03G 21/1676; G03G 21/1652; G03G 21/1647
USPC 399/90, 91, 110, 111, 113, 114
See application file for complete search history.

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(57) **ABSTRACT**

An image forming apparatus includes: a main casing provided with a main-body electrode; a cartridge; a supporting member for supporting the cartridge; and a first displacing mechanism. The cartridge includes a processing body elongated in a first direction and a power-receiving part capable of contacting the main-body electrode. The supporting member is movable between a first position inside the main casing and a second position outside the main casing in a second direction generally perpendicular to the first direction. The first displacing mechanism is configured to move the cartridge supported in the supporting member in the first direction from a non-contact position where the main-body electrode and the power-receiving part are separated from each other to a contact position where the main-body electrode and the power-receiving part are in contact with each other.

20 Claims, 10 Drawing Sheets

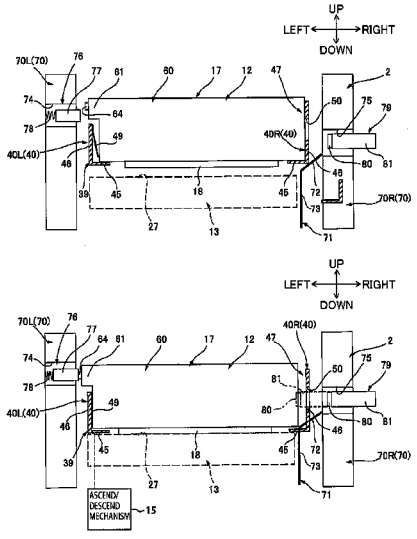
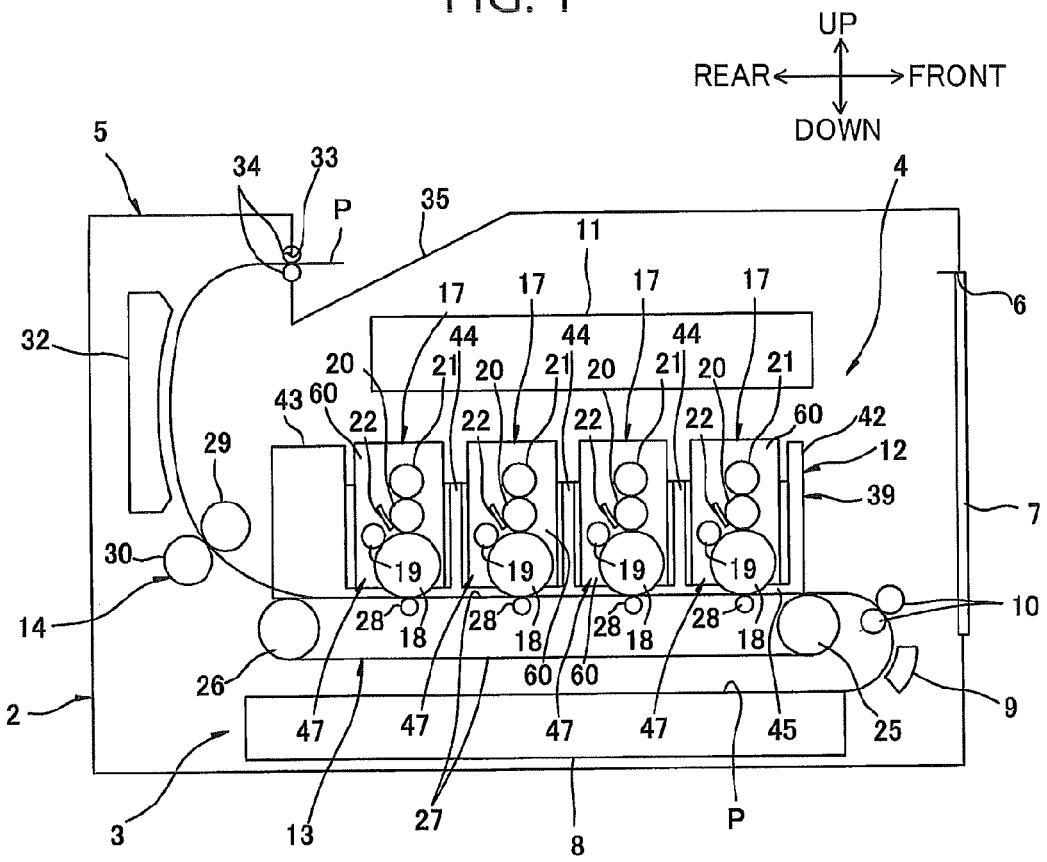


FIG. 1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42
12
39
29
7
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3
13
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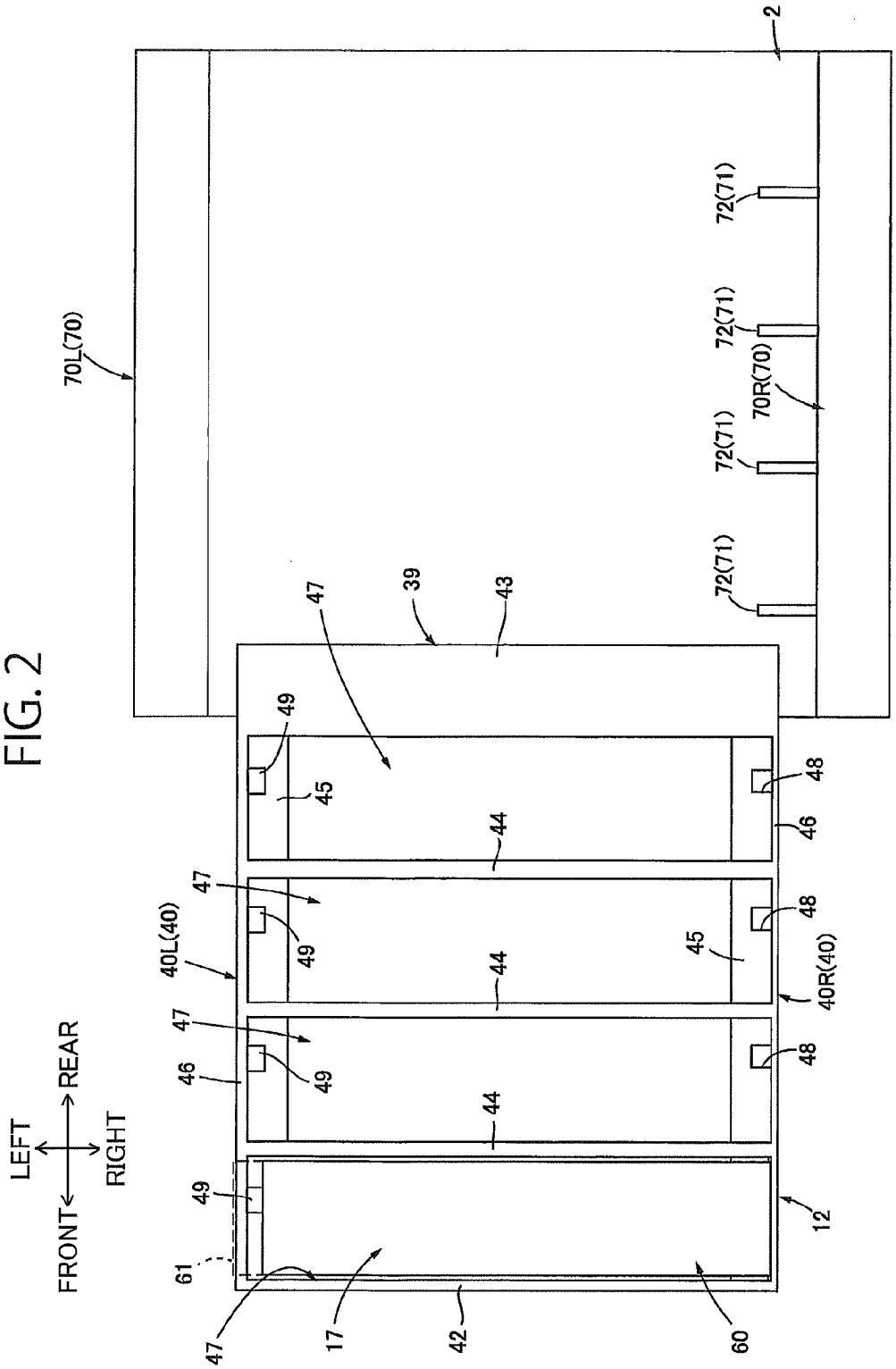
8
P

1

FIG. 2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17
42
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REAR

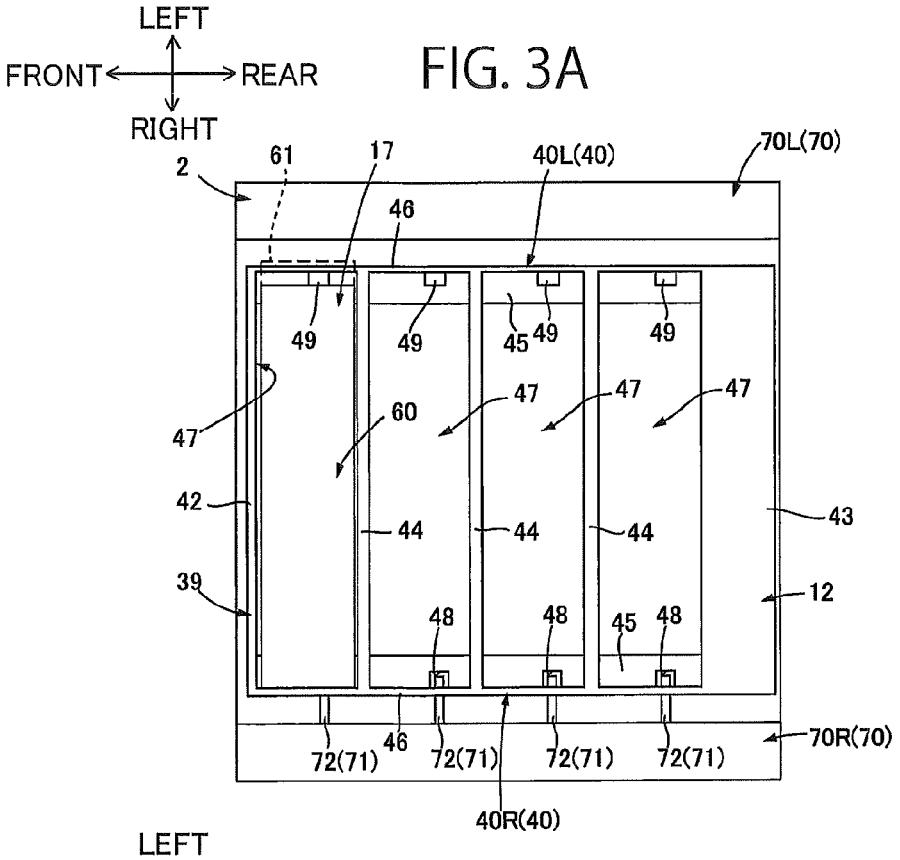
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FIG. 3A
2
61
17
40L(40)
70L(70)
46
49
49
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49
49
47
47
47
47
60
42
43
44
44
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72(71)
72(71)
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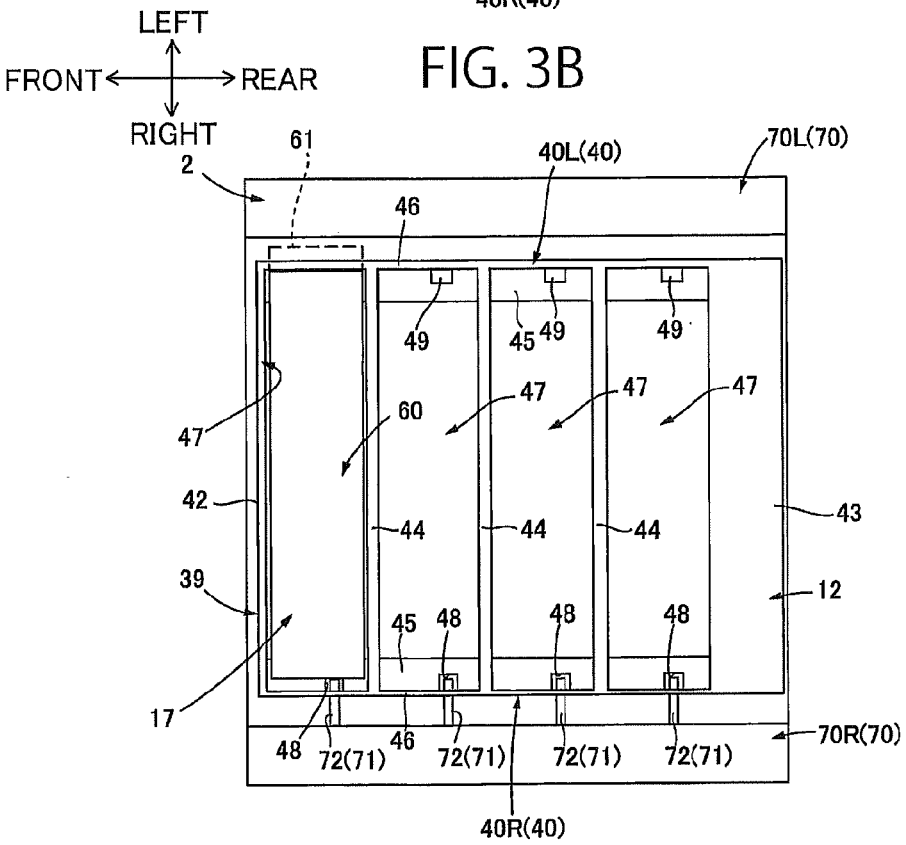
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FIG. 3B
2
61
40L(40)
70L(70)
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49
45
49
49
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47
47
47
60
42
43
44
44
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39
12
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48
48
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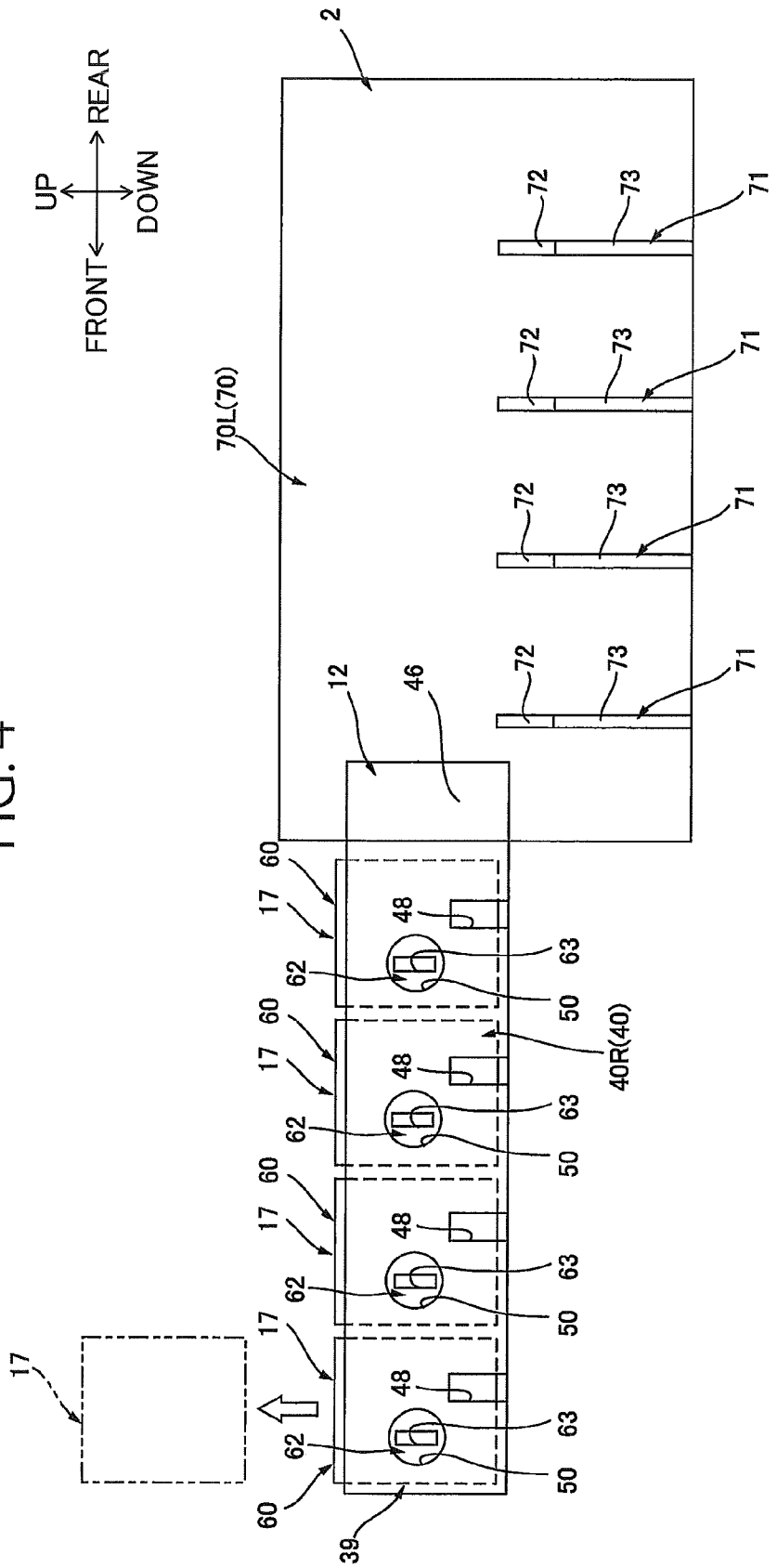
17
48
72(71)
46
72(71)
72(71)
72(71)
70R(70)
40R(40)

FIG. 4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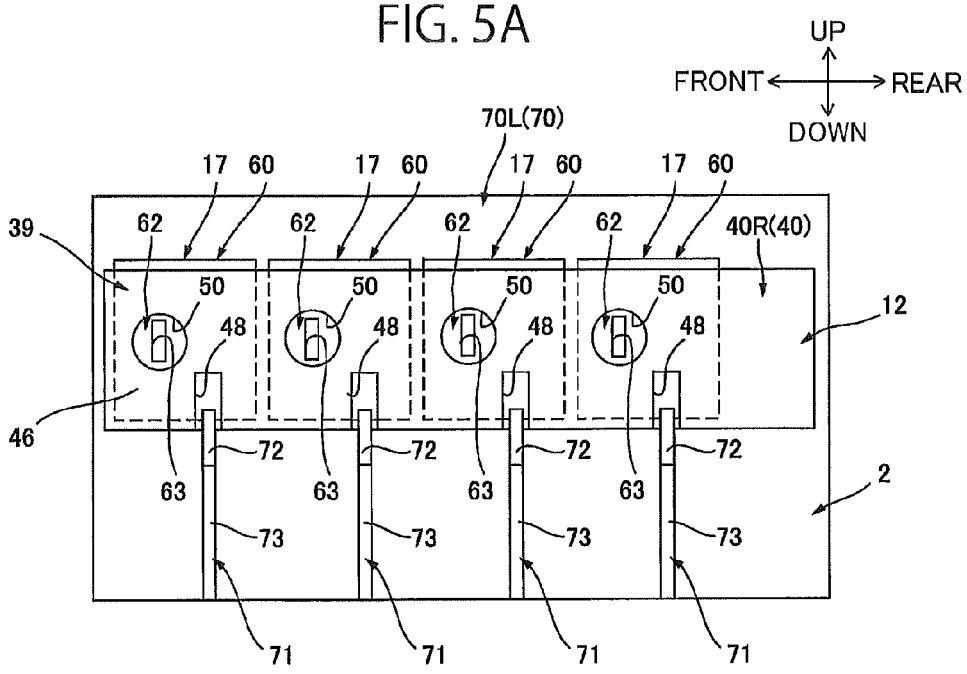
39

FIG. 5A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17 60
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50
50
48
48
48
48
12
46
72
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72
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2
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73
73
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71
71

FIG. 5B

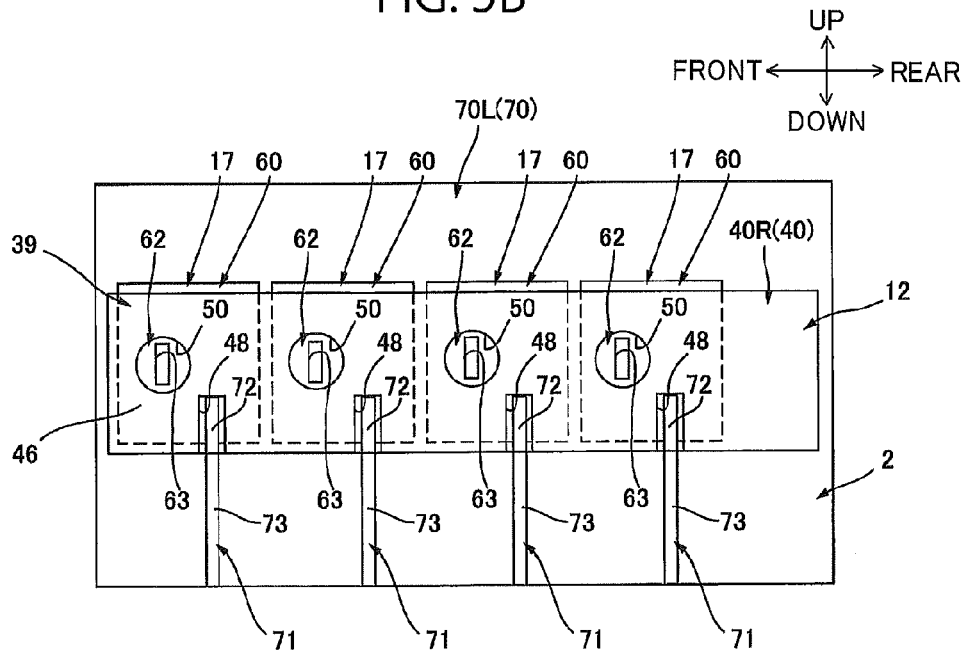
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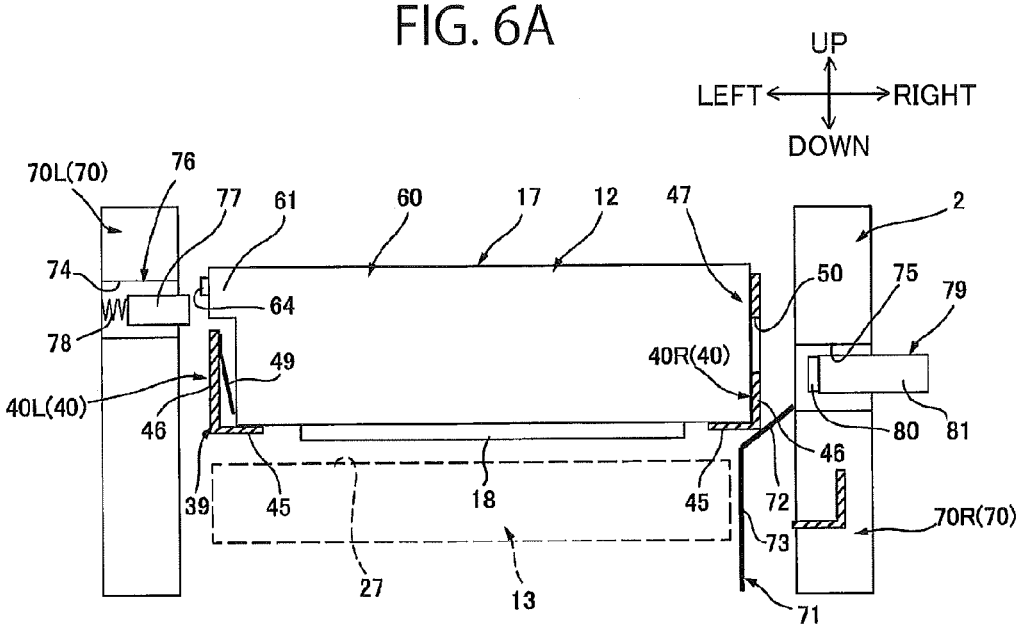
FIG. 6A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40R(40)
40L(40)
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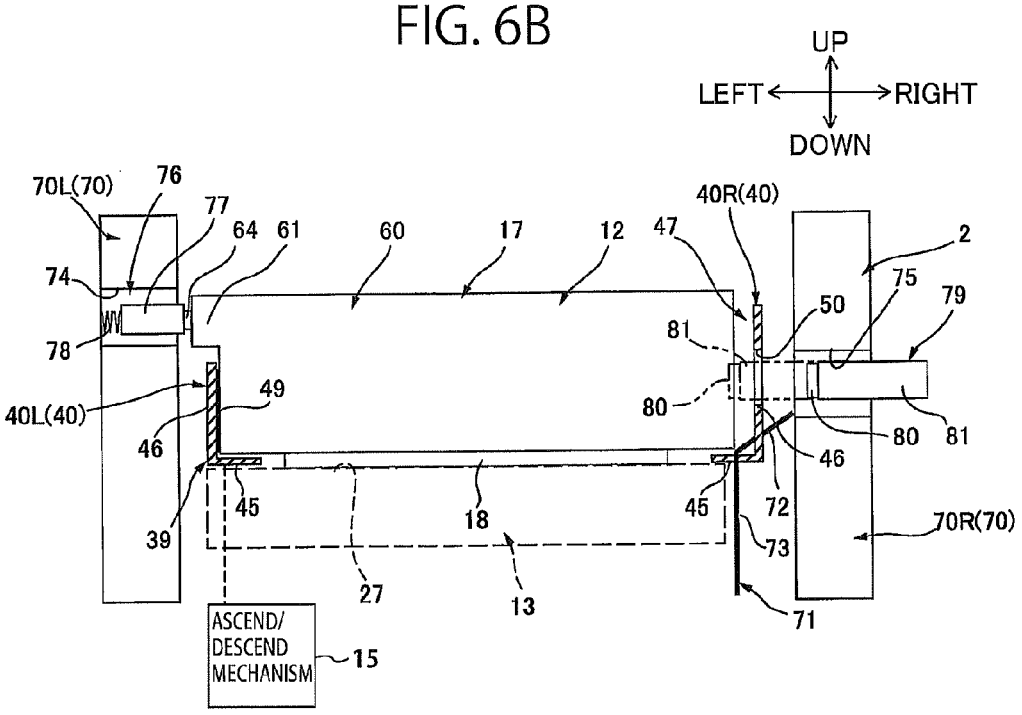
71

FIG. 6B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40L(40)
80
46
80
81
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18
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73
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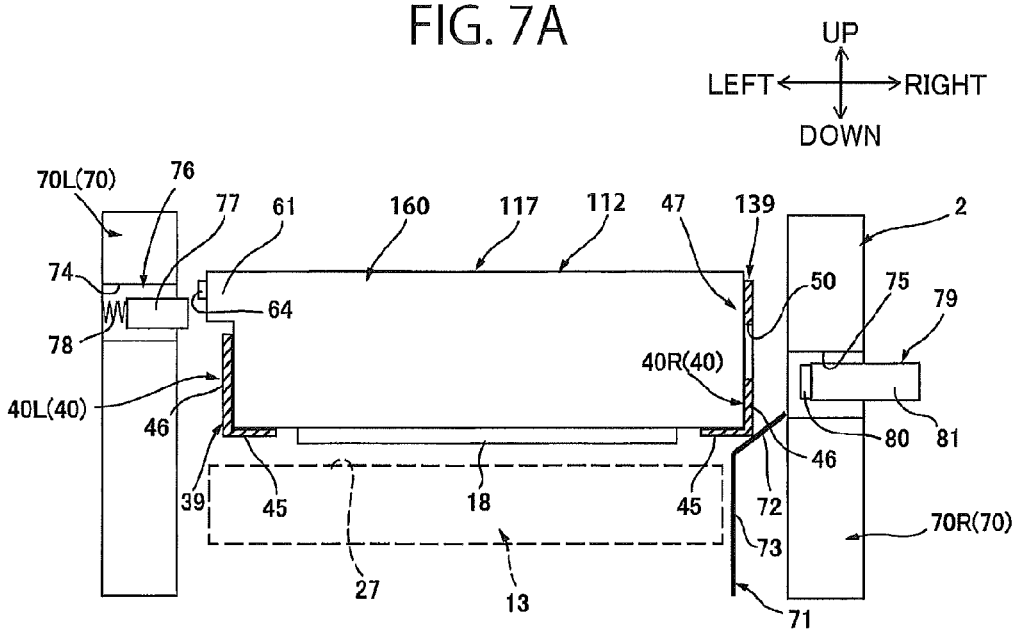
13
71
ASCEND/
DESCEND
MECHANISM
15

FIG. 7A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40R(40)
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18
45
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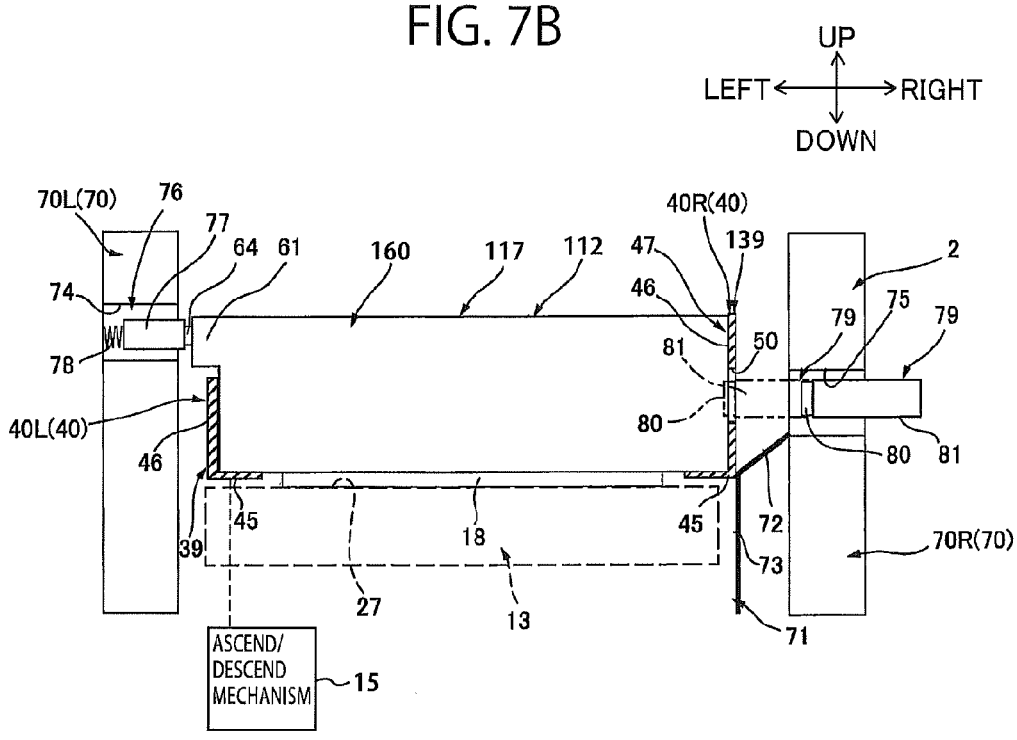
27
13
71

FIG. 7B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40L(40)
80
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81
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18
73
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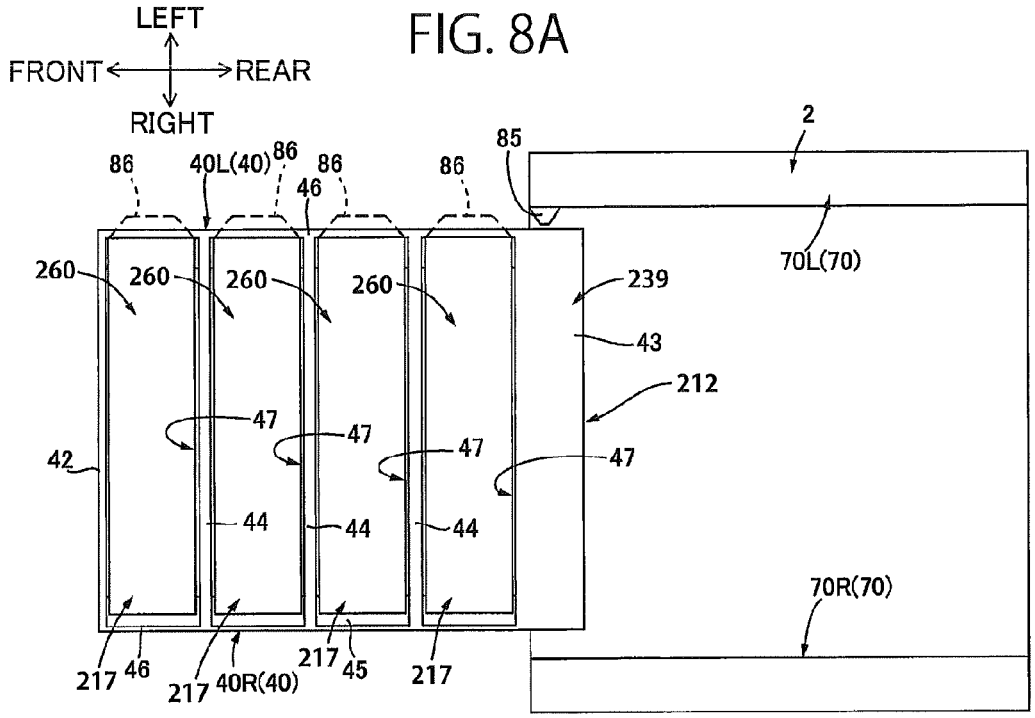
71
ASCEND/
DESCEND
MECHANISM
15

FIG. 8A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212
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217
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217

FIG. 8B

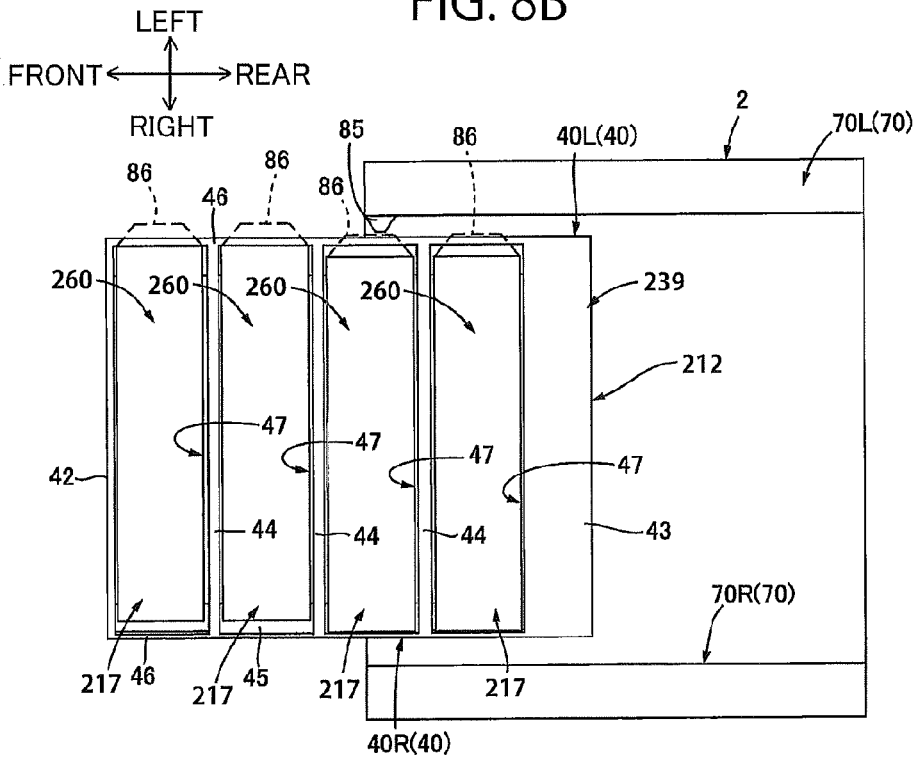
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FIG. 9A

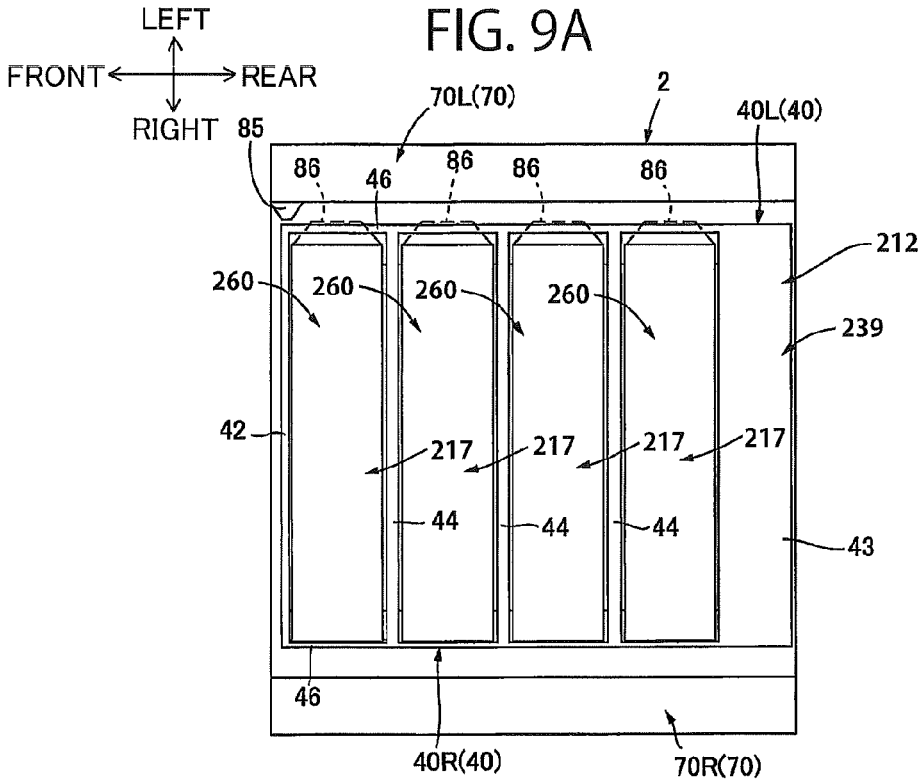
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FIG. 9B

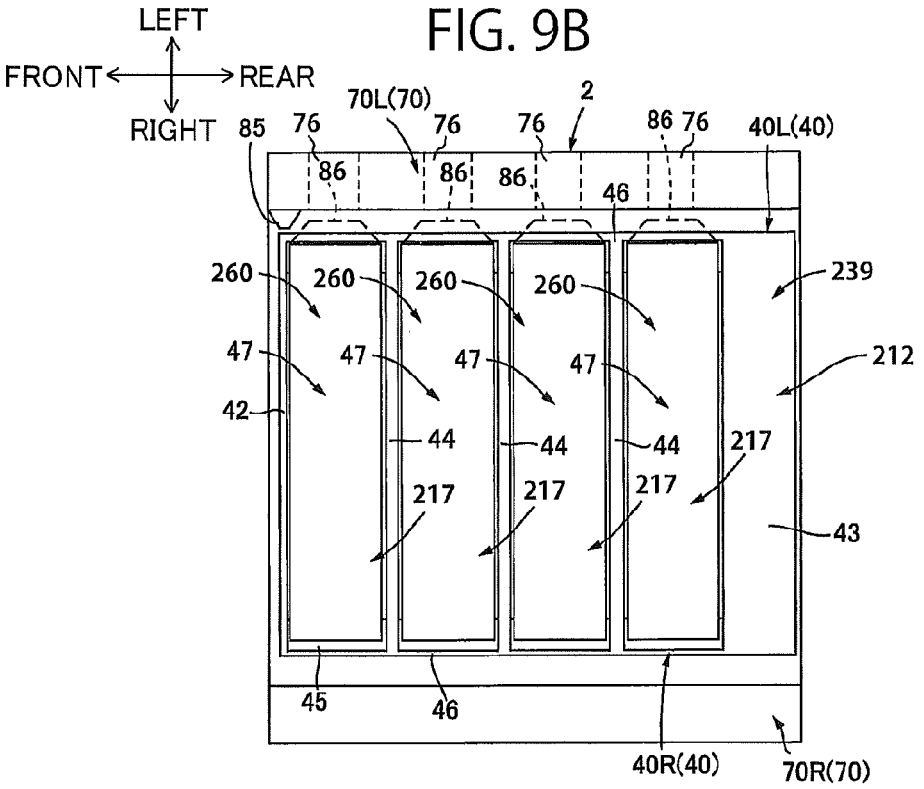
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FIG. 10A

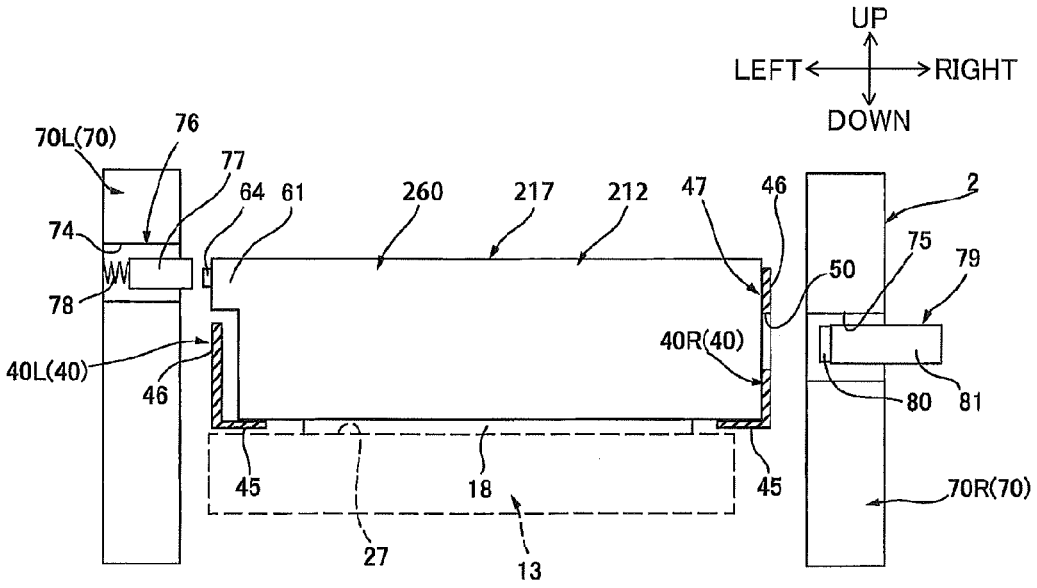

FIG. 10B

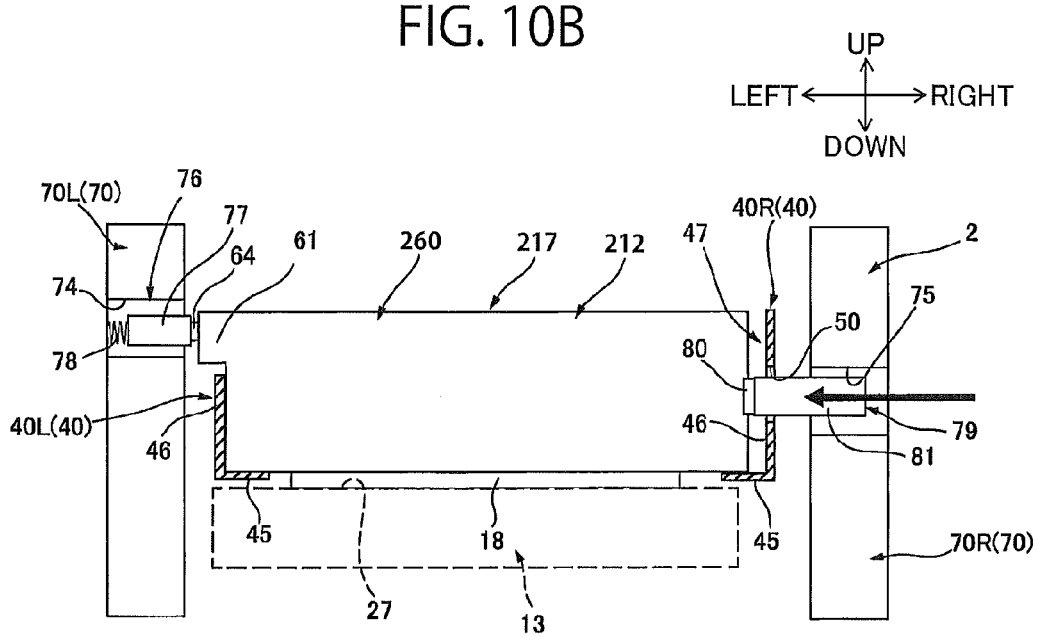

IMAGE FORMING APPARATUS HAVING MOVABLE SUPPORTING MEMBER FOR SUPPORTING CARTRIDGE

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Japanese Patent Application No. 2013-074690 filed Mar. 29, 2013. The entire content of the priority application is incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to an electro-photographic image forming apparatus.

BACKGROUND

A known tandem-type color printer includes a main body and a plurality of cartridges detachably mountable in the main body.

One of such conventional color printers includes a main body and a cartridge tray configured to be held in the main body so as to be slidable relative to the main body. In this color printer, the cartridge tray supports therein a plurality of cartridges juxtaposed to one another (see Japanese Patent Application Publication No. 2008-165025).

SUMMARY

It is an object of the present invention to provide an improved image forming apparatus.

In order to attain the above and other objects, there is provided an image forming apparatus including a main casing, a cartridge, a supporting member and a first displacing mechanism. The main casing is provided with a main-body electrode. The cartridge includes a processing body elongated in a first direction for image formation and a power-receiving part configured to contact the main-body electrode for receiving power therefrom and for supplying the power to the processing body. The supporting member is configured to support the cartridge therein, the supporting member being movable between a first position and a second position in a second direction generally perpendicular to the first direction, the supporting member at the first position being positioned outside the main casing and the supporting member at the second position being positioned inside the main casing. The first displacing mechanism is configured to move the cartridge supported in the supporting member from a non-contact position to a contact position in the first direction, the main-body electrode and the power-receiving part being separated from each other at the non-contact position of the cartridge, the main-body electrode and the power-receiving part being in contact with each other at the contact position of the cartridge.

According to another aspect of the present invention, there is provided an image forming apparatus including a main casing, a cartridge, a drawer and a first displacing mechanism. The main casing is provided with a main-body electrode. The cartridge includes a developing roller extending a first direction and a cartridge electrode configured to contact the main-body electrode and supply an electric power to the developing roller. The drawer is configured to support the cartridge, the drawer being movable between a first position and a second position in a second direction intersecting the first direction, the drawer at the first position being positioned outside the main casing and the drawer at the second position being positioned inside the main casing, the drawer being configured to move between a non-contact position and a contact position in the first direction, the main-body electrode and the cartridge electrode being separated from each other at the non-contact position of the drawer, the main-body electrode and the cartridge electrode being in contact with each other at the contact position of the drawer. The first displacing mechanism is configured to displace the drawer from the non-contact position to the contact position.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a schematic central cross-sectional view illustrating a general configuration of a printer according to a first embodiment of the present invention, wherein a drawer unit according to the first embodiment is accommodated in a main casing of the printer;

FIG. **2** is a plan view of the drawer unit and the main casing according to the first embodiment, wherein a drawer frame of the first embodiment is in a pulled-out position;

FIG. **3**A is a plan view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in an intermediate position;

FIG. **3**B is a plan view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in a mounted position;

FIG. **4** is a right side view of the drawer unit and the main casing according to the first embodiment, the drawer frame is in the pulled-out position;

FIG. **5**A is a right side view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in the intermediate position;

FIG. **5**B is a right side view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in the mounted position;

FIG. **6**A is a front view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in the intermediate position;

FIG. **6**B is a front view of the drawer unit and the main casing according to the first embodiment, wherein the drawer frame is in the mounted position;

FIG. **7**A is a front view of a drawer unit and a main casing according to a second embodiment of the present invention, wherein a drawer frame according to the second embodiment is in the intermediate position;

FIG. **7**B is a front view of the drawer unit and the main casing according to the second embodiment, wherein the drawer frame is in the mounted position;

FIG. **8**A is a plan view of a drawer unit and a main casing according to a third embodiment of the present invention, wherein a drawer frame according to the third embodiment is in the pulled-out position;

FIG. **8**B is a plan view of the drawer unit and the main casing according to the third embodiment, wherein the drawer frame is in a position between the pulled-out position and the intermediate position;

FIG. **9**A is a plan view of the drawer unit and the main casing according to the third embodiment, wherein the drawer frame is in the intermediate position;

FIG. **9**B is a plan view of the drawer unit and the main casing according to the third embodiment, wherein the drawer frame is in the mounted position;

FIG. **10**A is a front view of the drawer unit and the main casing according to the third embodiment, wherein a process cartridge of the third embodiment is in a retracted position; and

FIG. **10**B is a front view of the drawer unit and the main casing according to the third embodiment, wherein the process cartridge of the third embodiment is in an advanced position.

DETAILED DESCRIPTION

1. General Structure of the Printer

A printer **1** is a horizontal direct tandem-type color laser printer, as shown in FIG. **1**. The printer **1** is an example of an image forming apparatus according to a first embodiment of the present invention.

First, a general structure of the printer **1** will be described with reference to FIG. **1**.

Throughout the specification, the terms "above", "below", "right", "left", "front", "rear" and the like will be used assuming that the printer **1** is resting on a level surface. More specifically, in FIG. **1**, a right side, a left side, a near side and a far side will be referred to as a front side, a rear side, a left side and a right side of the printer **1**, respectively.

(1) Main Casing

The main casing **2** has a substantially rectangular box shape in a side view. The main casing **2** has a front wall formed with an opening **6**, and a front cover **7**. The front cover **7** is configured to be pivotally movable about a lower end portion thereof between a closing position closing the opening **6** (show by a solid line in FIG. **1**) and an opening position opening the opening **6** (shown by a broken line in FIG. **1**). The main casing **2** houses therein a sheet supply section **3** and an image forming section **4**.

(2) Sheet Supply Section

The sheet supply section **3** has a sheet cassette **8**, a sheet supply guide **9** and a pair of registration rollers **10**. The sheet cassette **8** serves to accommodate sheets of paper P therein. The sheet cassette **8** is detachably attached to a bottom portion of the main casing **2**.

The sheets P stacked in the sheet cassette **8** are fed one by one, and directed upward and rearward toward between the pair of registration rollers **10** while being guided along a U-shaped path by the sheet guide **9**, and then conveyed at a prescribed timing toward between a photosensitive drum **18** (described later) and a conveying belt **27** (described later) of the image forming section **4**.

(3) Image Forming Section

The image forming section **4** includes a scanner unit **11**, a drawer unit **12**, a transfer unit **13**, and a fixing unit **14**.

(3-1) Scanner Unit

The scanner unit **11** is disposed at an upper portion of the main casing **2**. The scanner unit **11** emits a laser beam to each of a plurality of photosensitive drums **18** (described later) based on image data to expose the corresponding photosensitive drum **18** to light.

(3-2) Drawer Unit

The drawer unit **12** is disposed at a position generally center of the main casing **2** in an up-down direction and below the scanner unit **11**.

The drawer unit **12** includes a drawer frame **39** and four process cartridges **17** corresponding to respective four colors used in the printer **1**. The four process cartridges **17** are attachable to and detachable from the drawer frame **39**.

The four process cartridges **17** are arranged spaced apart from one another in the front-rear direction in the drawer frame **39**. The process cartridges **17** include a black process cartridge **17**K, a yellow process cartridge **17**Y, a magenta process cartridge **17**M, and a cyan process cartridge **17**C arranged in the drawer frame **39** in the mentioned order from the front to the rear.

Each of the four process cartridges **17** includes the photosensitive drum **18**, a charging roller **19**, a developing roller **20**, a supply roller **21**, and a thickness regulation blade **22**.

The photosensitive drum **18** has a substantially cylindrical shape extending in a left-right direction. The photosensitive drum **18** is rotatably supported by a lower end portion of the process cartridge **17**. A lower end portion of the photosensitive drum **18** is exposed downward from the process cartridge **17**.

The charging roller **19** has a substantially columnar shape extending in the left-right direction. The charging roller **19** is rotatably supported in the process cartridge **17** to be in contact with an upper rear portion of the photosensitive drum **18**.

The developing roller **20** has a substantially columnar shape extending in the left-right direction. The developing roller **20** is rotatably supported in the process cartridge **17** to be in contact with an upper portion of the photosensitive drum **18**.

The supply roller **21** has a substantially columnar shape extending in the left-right direction. The supply roller **21** is rotatably supported in the process cartridge **17** to be in contact with an upper portion of the developing roller **20**.

The thickness regulation blade **22** is rotatably supported in the process cartridge **17** to be in contact with a rear portion of the developing roller **20**.

Each of the four process cartridge **17** houses toner of one of four colors in a space provided above the developing roller **20** and thickness regulation blades **22**. That is, the toner within the process cartridge **17** is positioned in the vicinity of the supply roller **21**.

The supply roller **21** supplies the toner in the process cartridge **17** to the developing roller **20**. At this time, the toner is tribo-charged with a positive polarity between the supply roller **21** and developing roller **20**.

Subsequently, as the developing roller **20** rotates, the toner on the developing roller **20** is regulated by the thickness regulation blade **22** and carried as a thin toner layer of a uniform thickness on a surface of the developing roller **20**.

In the meantime, a surface of the photosensitive drum **18** is uniformly and positively charged by the charging roller **19** as the photosensitive drum **18** rotates. Then, the scanner unit **11** emits a laser beam to the charged surface of the photosensitive drum **18** to expose the surface of the photosensitive drum **18** to light. As a result, an electrostatic latent image corresponding to an image to be formed on the sheet P is formed on the surface of the photosensitive drum **18**.

As the photosensitive drum **18** further rotates, the toner carried on the surface of the developing roller **20** and having a positive polarity is supplied to the electrostatic latent image formed on the surface of the photosensitive drum **18**. In this way, a toner image is formed on the surface of the photosensitive drum **18** through a reversal phenomenon. In other words, the developing roller **20**, supply roller **21**, and charging roller **19** are used for image formation.

(3-3) Transfer Unit

In the main casing **2**, the transfer unit **13** is disposed above the sheet supply section **3** but below the drawer unit **12** within the main casing **2**. The transfer unit **13** extends in the front-rear direction.

The transfer unit **13** includes a drive roller **25**, a driven roller **26**, the conveying belt **27**, and four transfer rollers **28**.

The drive roller **25** and driven roller **26** are arranged to be spaced apart from each other in the front-rear direction. The conveying belt **27** is mounted on and around the drive roller **25** and driven roller **26** in a tout state. Each of the four transfer rollers **28** is disposed to correspond to the corresponding one of the four photosensitive drums **18** such that an upper portion of the conveying belt **27** is interposed between each of the pairs of the transfer roller **28** and the photosensitive drum **18**. Each pair of the transfer roller **28** and the photosensitive drum **18** defines a transfer position therebetween on the conveying belt **27**.

The sheet P supplied from the sheet supply section **3** is conveyed by the conveying belt **27** conveys from the front side to rear side to sequentially passes through the four transfer positions. During passage of the sheet P through the transfer positions, the toner images of the respective colors carried on the respective photosensitive drums **18** are sequentially superimposed onto the sheet P to form a color image thereon.

(3-4) Fixing Unit

The fixing unit **14** is disposed rearward of the transfer unit **13**. The fixing unit **14** includes a heating roller **29** and a pressure roller **30**. The pressure roller **30** is disposed at a lower rear side of the heating roller **29** and in contact with a lower rear portion of the heating roller **29**.

As the sheet P passes between the heating roller **29** and pressure roller **30**, the toner image transferred onto the sheet P is thermally fixed thereon due to application of heat and pressure by the heating roller **29** and pressure roller **30**

(4) Sheet Discharge Section

The sheet discharge section **5** is disposed above the fixing unit **14**. The sheet discharge section **5** includes a discharge guide **32**, a discharge port **33**, a pair of discharge rollers **34**, and a discharge tray **35**.

The sheet P on which the toner image has been thermally fixed in the fixing unit **14** is fed upward and frontward while making a U-turn with a guide by the discharge guide **32**. The sheet P then passes between the pair of discharge rollers **34**, and is finally discharged onto the discharge tray **35** through the discharge port **33**.

2. Detailed Structure of the Drawer Unit

As illustrated in FIGS. **2** and **4**, the drawer unit **12** includes the drawer frame **39** and the four process cartridges **17**. For the sake of explanation purpose, only a frontmost process cartridge **17** among the four process cartridges **17** is illustrated in FIGS. **2** and **3**.

(1) Drawer Frame

The drawer frame **39** is configured to move between a mounted position at which the drawer frame **39** is mounted in the main casing **2** (as illustrated in FIG. **1**) and a pulled-out position at which the drawer **39** is pulled out from the main casing **2** (as illustrated in FIG. **4**).

As illustrated in FIG. **2**, the drawer frame **39** has a substantially rectangular frame shape in a plan view and includes a pair of side walls **40**, a front wall **42**, a rear wall **43**, and partition walls **44**.

The pair of side walls **40** is disposed away from each other in the left-right direction. Each of the pair of side walls **40** has an L-like shape in a front view as illustrated in FIG. **6**A and extends in the front-rear direction as illustrated in FIG. **4**.

Specifically, the side wall **40** includes a main part **46** and a cartridge support wall **45**. The main part **46** has a substantially rectangular plate-like shape in a side view and extends in the front-rear direction, as shown in FIG. **4**. The cartridge support wall **45** protrudes inward from a lower end portion of the main part **46** in the left-right direction, as illustrated in FIG. **6**A. The cartridge support wall **45** has a substantially rectangular plate-like shape in a plan view and extends in the front-rear direction.

Hereinafter, the side wall **40** on the right is referred to as a right side wall **40**R, and the side wall **40** on the left is referred to as a left side wall **40**L, whenever necessary.

As illustrated in FIG. **6**A, the main part **46** of the left side wall **40**L has a length (height) smaller than that of the main part **46** of the right side wall **40**R in the up-down direction.

The front wall **42** has a substantially rectangular plate-like shape in a front view and extends in the left-right direction to connect front end portions of the pair of side walls **40**.

The rear wall **43** has a substantially rectangular plate-like shape in a rear view and extends in the left-right direction to connect rear end portions of the pair of side walls **40**.

Each of the partition walls **44** has a substantially rectangular plate-like shape in a front view and extends in the left-right direction **44**. The three partition walls **44** are arranged in opposition to and in separation from one another in the front-rear direction to divide an inner space of the drawer frame **39** substantially equally in the front-rear direction. Left and right end portions of each partition wall **44** are connected to the left and right side walls **40**L and **40**R respectively.

Specifically, the three partition walls **44** are arranged to partition a space between the front wall **42** and rear wall **43** of the drawer frame **39** at substantially equal-intervals in the front-rear direction to provide four spaces arranged in the front-rear direction. That is, the inner space of the drawer frame **39** is partitioned into four spaces, each functioning as a space for housing each of the four process cartridges **17** (referred to as a "cartridge housing space **47**" hereinafter).

More specifically, the front wall **42**, the frontmost partition wall **44**, and portions of both side walls **40** therebetween define a frontmost cartridge housing space **47**. The frontmost partition wall **44**, center partition wall **44**, and portions of both side walls **40** therebetween define a second frontmost cartridge housing space **47**. The center partition wall **44**, the rearmost partition wall **44**, and portions of both side walls **40** therebetween define a third frontmost cartridge housing space **47**. The rearmost partition wall **44**, rear wall **43**, and portions of both side walls **40** therebetween define a rearmost cartridge housing space **47**.

Further, as illustrated in FIG. **4**, the right side wall **40**R is formed with four through-holes **50** and four openings **48**.

The through-holes **50** are formed to correspond to the cartridge housing spaces **47** respectively. More specifically, the four through-holes **50** are formed in the main part **46** of the right side wall **40**R to be spaced apart from one another in the front-rear direction. Each through-hole **50** has a substantially circular shape and penetrates the main part **46** in the left-right direction.

Each of the cartridge housing spaces **47** are thus in communication with outside of the drawer frame **39** through corresponding one of the through-holes **50**.

The four openings **48** are also positioned to correspond to the four cartridge housing spaces **47**, respectively. More specifically, in the right side wall **40**R, the openings **48** are formed to be aligned and spaced apart from one another in the front-rear direction, each at a position downward and rearward of each through-hole **50**.

Each opening **48** is open on the lower end portion of the main part **46** and on a right end portion of the cartridge support wall **45** to permit a guide portion **72** of an abutting member **71** (described later) to pass through the opening **48**. More specifically, each opening **48** penetrates the lower end portion of the main part **46** in the left-right direction as well as the right end portion of the cartridge support wall **45** in the

up-down direction. Hence, each cartridge housing space **47** is in communication with outside of the drawer frame **39** through corresponding one of the openings **48**.

Further, as illustrated in FIG. **2**, the drawer frame **39** includes four biasing members **49**.

The four biasing members **49** are provided to correspond to the four cartridge housing spaces **47**, respectively.

Specifically, each biasing member **49** is disposed within the corresponding cartridge housing space **47** at a position rightward of and adjacent to the main part **46** of the left side wall **40**L. The biasing members **49** are thus aligned and spaced apart from one another in the front-rear direction.

As illustrated in FIG. **6**A, the biasing members **49** are formed as a leaf spring (a resilient member). Each biasing member **49** has an upper portion extending in the front-rear direction and a lower portion extending diagonally downward and rightward from a bottom end of the upper portion. The upper portion of each biasing member **49** is fixed to a right surface of the main part **46** of the left side wall **40**L, and the lower portion of each biasing member **49** has a distal end that is positioned above an upper surface of the corresponding cartridge support wall **45** of the left side wall **40**L in the up-down direction.

(2) Process Cartridge

As illustrated in FIG. **4**, the process cartridges **17** are detachably accommodated in the corresponding cartridge housing spaces **47**, respectively. As illustrated in FIG. **6**A, lower end portions of the process cartridges **17** are in abutment with the upper surfaces of the cartridge support walls **45** of the left and right side walls **40**L and **40**R, whereby the drawer frame **39** supports the process cartridges **17**.

Each process cartridge **17** includes a casing **60** of substantially box-like shape, as shown in FIG. **1**. The casing **60** has a lower end that is open downward. The lower end portion of the photosensitive drum **18** is exposed through the open lower end of the casing **60**, as illustrated in FIG. **6**A. The casing **60** has a dimension smaller than a distance between the main parts **46** of the left and right side walls **40**L and **40**R in the left-right direction. Thus, the process cartridges **17** are movable with respect to the left-right direction while being accommodated in the corresponding cartridge housing spaces **47**.

The casing **60** has a left side wall on which an electrode retaining part **61** is provided. The electrode retaining part **61** has a substantially rectangular columnar shape extending in the left-right direction and protrudes leftward from an upper portion of a left surface of the casing **60**.

The electrode retaining part **61** includes an electrode contact **64**. The electrode contact **64** has a substantially rectangular columnar shape extending in the left-right direction and protrudes leftward from a general center of a left surface of the electrode retaining part **61**. Although not illustrated, the electrode contact **64** is electrically connected to an internal configuration of the casing **60** such that the electrode contact **64** is configured to receive electric power from an electrode unit **76** (described later) of the main casing **2** and to supply the received electric power to the photosensitive drum **18**, charging roller **19**, developing roller **20**, and supply roller **21**.

Further, the casing **60** has a right side wall in which a cartridge coupling **62** is disposed, as illustrated in FIG. **4**.

The cartridge coupling **62** is substantially circular disk-like shaped in a side view and is disposed at a substantial center of a front portion of the right side wall of the casing **60**. The cartridge coupling **62** has a center portion in which a concave portion **63** is formed. The concave portion **63** has a substantially rectangular shape in a side view and extends in a radial direction of the cartridge coupling **62**. The concave portion **63** is depressed leftward from a right surface of the cartridge coupling **62**.

The cartridge coupling **62** is exposed rightward through the corresponding through-hole **50** of the right side wall **40**R when the process cartridge **17** is housed in the corresponding cartridge housing space **47**.

Although not illustrated, the cartridge coupling **62** is connected to a gear train so as to receive drive force from a main-body coupling **79** (described later) and to transmit the drive force to the photosensitive drum **18**, charging roller **19**, developing roller **20**, and supply roller **21**.

As illustrated in FIG. **6**A, when the process cartridge **17** is housed in the corresponding cartridge housing space **47**, the casing **60** is biased rightward by the biasing member **49** such that the process cartridge **17** is normally placed in a retracted position at which the process cartridge **17** is displaced rightward within the cartridge housing space **47**.

When the process cartridge **17** is in the retracted position, the left surface of the electrode retaining part **61** of the casing **60** is substantially flush with a left surface of the left side wall **40**L of the drawer frame **39**, as illustrated by a broken line in FIG. **2**. In other words, when the process cartridge **17** is in the retracted position, the electrode contact **64** cannot contact the corresponding electrode unit **76**.

3. Detailed Structure of the Main Casing

As illustrated in FIG. **6**A, the main casing **2** has a pair of main-body side walls **70**, four electrode units **76**, four main-body couplings **79**, and four abutting members **71**.

The pair of main-body side walls **70** includes a left main-body side wall **70**L and a right main-body side wall **70**R disposed in opposition to and in separation from each other in the left-right direction.

The left main-body side wall **70**L includes four electrode insertion holes **74**. The electrode insertion holes **74** are positioned to correspond to the electrode contacts **64** of the process cartridges **17**, respectively. More specifically, the four electrode insertion holes **74** are arranged to be spaced away from one another in the front-rear direction and formed in an upper portion of the left main-body side wall **70**L to penetrate therethrough in the left-right direction.

The right main-body side wall **70**R includes four coupling insertion holes **75**. The coupling insertion holes **75** are positioned to correspond to the cartridge couplings **62** of the process cartridges **17**, respectively. More specifically, the four coupling insertion holes **75** are arranged to be spaced away from one another in the front-rear direction and formed in a substantially vertical center of the right main-body side wall **70**R to penetrate therethrough in the left-right direction.

The four electrode units **76** are provided to correspond to the electrode insertion holes **74** of the left main-body side wall **70**L. Specifically, the electrode units **76** are disposed within the respective electrode insertion holes **74**. Although not illustrated, the electrode units **76** are electrically connected to a power source provided in the main casing **2**.

Each electrode unit **76** includes a spring member **78** and a main-body contact **77**.

The spring member **78** is an air-cored coil shaped and extends in the left-right direction. The spring member **78** has a left end fixed to the left main-body side wall **70**L so as not to move relative to the same.

The main-body contact **77** has a substantially columnar shape extending in the left-right direction. The main-body contact **77** has a left end fixed to a right end of the spring member **78**. With this configuration, the main-body contact

77 is movable in the left-right direction and is normally biased rightward by the spring member 78.

The four main-body couplings 79 are provided to correspond to the coupling insertion holes 75 of the right main-body side wall 70R. Specifically, the main-body coupling 79 are disposed within the respective coupling insertion holes 75.

The main-body coupling 79 has a columnar portion 81 and a convex portion 80. The columnar portion 81 has a substantially columnar shape extending in the left-right direction. The convex portion 80 is so configured as to be insertable into the concave portion 63 of the cartridge coupling 62. The convex portion 80 protrudes leftward from a left end face of the columnar portion 81.

The main-body coupling 79 is configured to move between a non-transmission position (indicated by a solid line in FIG. 6B) at which the convex portion 80 is disposed within the coupling insertion hole 75 and a transmission position (indicated by a broken line in FIG. 6B) at which the convex portion 80 is positioned leftward of the right main-body side wall 70R. The main-body coupling 79 is configured to receive drive force from a drive source (not shown) such as a motor provided in the main casing 2. The main-body coupling 79 is thus rotatable upon receipt of the drive force.

As illustrated in FIG. 2, the four abutting members 71 are provided to correspond to the four process cartridges 17, respectively. Each abutting member 71 is disposed leftward of and adjacent to a lower portion of the right main-body side wall 70R (see FIG. 6A) such that each abutting member 71 is positioned rearward of and downward of each coupling insertion hole 75 in a left side view.

Specifically, the abutting member 71 includes a fixing portion 73 and a guide portion 72, as shown in FIG. 6A. The fixing portion 73 has a substantially rectangular columnar shape and extends vertically in the up-down direction. The fixing portion 73 has a lower end that is fixed to a bottom portion of the main casing 2. The guide portion 72 extends diagonally upward and rightward from an upper end of the fixing portion 73. The guide portion 72 has an upper end that is fixed to a left surface of the right main-body side wall 70R.

The main casing 2 further includes an ascend/descend mechanism 15 with a well-known structure.

The ascend/descend mechanism 15 is in interlocking relation with opening and closing of the front cover 7. Specifically, as the front cover 7 moves between the closing position and opening position, the ascend/descend mechanism 15 causes the drawer frame 39 to move generally in the up-down direction between the mounted position where each photosensitive drum 18 is in contact with the conveying belt 27 (FIG. 6B) and an intermediate position where each photosensitive drum 18 is separated from the conveying belt 27 (FIG. 6A). In other words, the ascend/descend mechanism 15 is configured to move the drawer frame 39 supporting the process cartridges 17 between the mounted position and intermediate position in the up-down direction in conjunction with closing and opening of the front cover 7.

Further, when the front cover 7 is at the opening position, the ascend/descend mechanism 15 is configured to guide the movement of the drawer frame 39 between the intermediate position (FIG. 6A) and pulled-out position (FIG. 4) in a state where the photosensitive drums 18 are separated from the conveying belt 27.

4. Attachment and Detachment of the Process Cartridge

(1) Attachment of the Process Cartridge to the Main Casing

For attaching the process cartridge 17 to main casing 2, first the front cover 7 is placed at the opening position, and the drawer frame 39 is displaced to the pulled-out position as illustrated in FIG. 4.

Then, the process cartridges 17 are inserted from above into the respective cartridge housing spaces 47 of the drawer frame 39 at the pulled-out position.

(1-1) Movement of the Drawer Frame from the Pulled-Out Position to the Mounted Position

Subsequently, the drawer frame 39 is pushed rearward from the pulled-out position. The ascend/descend mechanism 15 guides the rearward movement of the drawer frame 39. While the drawer frame 39 moves, each photosensitive drum 18 is kept separated from the conveying belt 27 (refer to FIG. 6A).

Incidentally, in this state, the process cartridges 17 supported by the drawer frame 39 are placed at the retracted position due to the corresponding biasing members 49. Thus, the electrode contacts 64 of the process cartridges 17 are spaced away from the corresponding main-body contacts 77 of the electrode units 76 in the left-right direction. At this time, the electrode contact 64 and main-body contact 77 are not aligned with each other (offset from each other) in the left-right direction (refer to FIG. 6A).

The drawer frame 39 is moved further rearward and reaches the intermediate position. In the intermediate position, as shown in FIG. 5A, the drawer frame 39 is accommodated in the main casing 2 and each opening 48 is positioned above the guide portion 72 of the corresponding abutting member 71.

That is, when the drawer frame 39 is in the intermediate position, the photosensitive drum 18 of each process cartridge 17 supported by the drawer frame 39 is disposed above the conveying belt 27 of the transfer unit 13 to be separated therefrom, and each opening 48 of the right side wall 40R is spaced away from the corresponding guide portion 72 of the abutting member 71 in the up-down direction.

Subsequently, the front cover 7 is moved from the opening position to the closing position.

In association with closing of the front cover 7, the drawer frame 39 is moved downward from the intermediate position by the ascend/descend mechanism 15.

Then, as illustrated in FIGS. 5B and 6B, the guide portion 72 of the abutting member 71 starts to enter the opening 48 of the drawer frame 39 and is received within the same. A lower right end portion (lower-right corner portion) of the process cartridge 17 supported by the drawer frame 39 thus abuts on the guide portion 72 of the abutting member 71 from above through the opening 48, as illustrated in FIG. 6B.

As the drawer frame 39 moves downward, the process cartridge 17 is guided by the slope of the guide portion 72. Accordingly, due to the abutment with the abutting member 71, the process cartridge 17 is gradually moved leftward from the retracted position (shown in FIG. 6A) against the biasing force of the biasing member 49.

As the drawer frame 39 moves further downward and reaches the mounted position, each photosensitive drum 18 is brought into contact with the conveying belt 27. At this time, each through-hole 50 of the drawer frame 39 is placed leftward of the corresponding main-body coupling 79, and the cartridge coupling 62 of each process cartridge 17 is posi-

tioned to oppose the corresponding main-body coupling **79** in the left-right direction through the corresponding through-hole **50**.

Incidentally, when the drawer frame **39** is in the mounted position, the guide of the process cartridge **17** by the guide portion **72** is completed, and the lower right end portion of the process cartridge **17** is in contact with a bent portion of the abutting member **71**, the bent portion being a portion at which the guide portion **72** and fixing portion **73** are connected to each other. The process cartridge **17** is thus displaced leftward in the drawer frame **39** to be placed at an advanced position (shown in FIG. **6**B).

In this state, the electrode retaining part **61** of the casing **60** protrudes leftward from the left side wall **40**L, and the electrode contact **64** is brought into contact with a right end portion of the main-body contact **77**. As a result, the electrode unit **76** and electrode contact **64** are electrically connected to each other, thereby enabling electric power from the power source (not shown) to be supplied to the photosensitive drum **18**, charging roller **19**, developing roller **20**, and supply roller **21** via the electrode unit **76** and electrode contact **64**. In other words, when the process cartridge **17** is in the advanced position, the electrode contact **64** and the electrode unit **76** are in contact with each other.

That is, while the drawer frame **39** supporting the process cartridge **17** moves from the intermediate position to the mounted position, the abutting member **71** moves the process cartridge **17**, relative to the drawer frame **39**, from the retracted position to the advanced position in the left-right direction.

With the above operation, the attachment of the process cartridge **17** to the main casing **2** is completed.

Incidentally, as illustrated in FIG. **6**B, the main-body coupling **79** moves from the non-transmission position to the transmission position after the drawer frame **39** is placed in the mounted position. Then, although not illustrated, the convex portion **80** of the main-body coupling **79** is fittingly engaged with the concave portion **63** of the corresponding cartridge coupling **62** so as not to rotate relative to each other. With this structure, drive force from the drive source (not shown) can be inputted to the photosensitive drum **18**, charging roller **19**, developing roller **20**, and supply roller **21** through the main-body coupling **79** and cartridge coupling **62**.

(2) Detachment of the Process Cartridge from the Main Casing

For detaching the process cartridge **17** from the main casing **2**, the above-described operation is performed in reverse.

Specifically, the front cover **7** is moved from the closing position to opening position. In association with the opening of the front cover **7**, the ascend/descend mechanism **15** moves the drawer frame **39** upward from the mounted position to intermediate position, as illustrated in FIGS. **6**A and **6**B.

At this time, the abutment between the process cartridge **17** and abutting member **71** is released. As a result, the process cartridge **17** is moved rightward from the advanced position due to the biasing force of the biasing member **49**, and is displaced to the retracted position. In other words, the biasing member **49** moves the process cartridge **17** from the advanced position to the retracted position while the drawer frame **39** supporting the process cartridge **17** moves from the mounted position to the intermediate position.

Accordingly, the contact between the electrode contact **64** of the process cartridge **17** and main-body contact **77** is released and the electrode contact **64** and main-body contact **77** are separated from each other in the left-right direction.

Subsequently, the drawer frame in the intermediate position is pulled out frontward as illustrated in FIG. **4**.

The drawer frame **39** is pulled out from the intermediate position until all the process cartridges **17** are exposed from above and placed at the pulled-out position, as illustrated in FIG. **4**. During the displacement of the drawer frame **39** from the intermediate position to the pulled-out position, each photosensitive drum **18** is kept separated from the conveying belt **27** in the up-down direction, as shown in FIG. **6**A, by the ascend/descend mechanism **15**.

Further, while the drawer frame **39** moves from the intermediate position to the pulled-out position, each electrode contact **64** passes upward and rightward of the corresponding main-body contact **77**.

Subsequently, each process cartridge **17** housed in each cartridge housing space **47** is lifted upward to be detached from the drawer frame **39**, as shown by the broken line in FIG. **4**.

The detachment of the process cartridge **17** from the main casing **2** is thus completed.

5. Operational and Technical Advantages

(1) As illustrated in FIGS. **6**A and **6**B, in the printer **1** of the first embodiment, the process cartridge **17** is configured to move in the left-right direction to be displaced from the retracted position to the advanced position. This structure realizes contact and separation of the electrode contact **64** relative to the electrode unit **76**. Thus, the electrode unit **76** can be simply configured.

If the electrode unit **76** is fixed in position, the electrode contact **64** may be brought into contact with or separation from the electrode units **76** simply by the movement of the process cartridge **17**. Thus, a mechanism for advancing and retracting the electrode unit **76** can be dispensed with. As a result, the electrode unit **76** can be simply configured and the printer **1** can be made compact.

(2) Further, the main casing **2** is provided with the conveying belt **27**, and the process cartridge **17** has the photosensitive drum **18** configured to contact the conveying belt **27**. In the main casing **2**, the drawer frame **39** is configured to move in the substantially up-down direction between the intermediate position at which each photosensitive drum **18** does not contact the conveying belt **27** and the mounted position at which each photosensitive drum **18** contacts the conveying belt **27**. In a state where the process cartridges **17** are supported by the drawer frame **39**, the abutting members **71** moves the process cartridges **17** to the advanced position during displacement of the drawer frame **39** from the intermediate position to the mounted position.

With this configuration, the process cartridges **17** is moved to the advanced position while the drawer frame **39** moves from the intermediate position to the mounted position. This means that, while the drawer frame **39** moves from the pulled-out position to the mounted position, the process cartridge **17** can be placed at the retracted position so that contact between the electrode unit **76** and electrode contact **64** can be prevented.

Thus, sliding contact between the main-body contact **77** of the electrode unit **76** and the electrode contact **64** of the electrode retaining part can be suppressed while the drawer frame **39** moves between the pulled-out position and mounted position, thereby restraining occurrence of attrition resulting from the sliding contact.

(3) The abutting members **71** are configured to move the process cartridges **17** from the retracted position to advanced position relative to the drawer frame **39**.

With this configuration, the abutting member **71** causes displacement of the process cartridge **17** from the retracted position to the advanced position, the electrode contact **64** can be brought into contact with the main-body contact **77** of the electrode unit **76** to establish electrical connection therebetween.

(4) Further, the abutting member **71** is configured to move the process cartridge **17** from the retracted position (FIG. **6**A) to the advanced position (FIG. **6**B) while the drawer frame **39** moves from the intermediate position (FIG. **6**A) to the mounted position (FIG. **6**B).

With this structure, contact between the main-body contact **77** of the electrode unit **76** and the electrode contact **64** can be reliably achieved.

(5) The main casing **2** has the abutting member **71** that can abut against the process cartridge **17**.

With this configuration, as illustrated in FIGS. **6**A and **6**B, since the process cartridge **17** is moved from the retracted position to the advanced position by abutment thereof against the abutting member **71**, the process cartridge **17** can be reliably moved from the retracted position to the advanced position.

(6) Further, in the printer **1**, the biasing member **49** is provided for moving the corresponding process cartridge **17** from the advanced position to the retracted position while the drawer frame **39** supporting the process cartridge **17** moves from the mounted position to the intermediate position.

With this configuration, since the biasing member **49** moves the process cartridge **17** from the advanced position to the retracted position while the drawer frame **39** moves from the mounted position to the intermediate position, sliding contact between the main-body contact **77** of the electrode unit **76** and the electrode contact **64** can be prevented while the drawer frame **39** is moved from the intermediate position to the pulled-out position.

(7) Further, the biasing member **49** is provided in the drawer frame **39** and is configured to move the corresponding process cartridge **17** from the advanced position to the retracted position during displacement of the drawer frame **39** supporting the process cartridge **17** from the mounted position (FIG. **6**B) to the intermediate position (FIG. **6**A).

With the above configuration, the main casing **2** can be simple as the biasing member **49** is disposed on the drawer frame **39**.

(8) Further, the biasing member **49** is formed by a leaf spring having a resiliency.

With the above configuration, the process cartridge **17** can be moved from the advanced position to the retracted position reliably even with a simple configuration.

6. Second Embodiment

Next, a detailed construction of a drawer unit **112** according to a second embodiment of the present invention will be described with reference to FIGS. **7**A and **7**B. In the following description, like parts and components are designated by the same reference numerals with those of the first embodiment to avoid duplicating description.

The drawer unit **112** includes a drawer frame **139** and four process cartridges **117** detachably supported in the drawer frame **139**.

In the drawer unit **12** of the first embodiment, the drawer frame **39** is formed with the openings **48** for permitting the abutting members **71** to pass therethrough, as shown in FIG. **2**. Further, the process cartridges **17** are housed in the respective cartridge housing spaces **47** such that each process cartridge **17** is movable in the left-right direction relative to the drawer frame **39**.

In contrast thereto, the drawer frame **139** of the second embodiment does not have the openings **48**, and the process cartridges **117** are housed in the cartridge housing spaces **47** so as not to move relative to the drawer frame **139**, as illustrated in FIGS. **7**A and **7**B.

Specifically, the process cartridge **117** of the second embodiment has a casing **160** whose dimension is substantially equal to the distance between the pair of side walls **40**. The drawer frame **139** does not include the biasing members **49**, unlike the drawer frame **39** of the first embodiment.

In the second embodiment, a lower right end portion of the drawer frame **139** abuts on the guide portions **72** of the four abutting members **71** when the drawer frame **139** is moved from the intermediate position (FIG. **7**A) to the mounted position (FIG. **7**B) due to the ascend/descend mechanism **15**. When the drawer frame **139** is in the intermediate position, each process cartridge **17** is positioned upper right of the electrode units **76** to be spaced away therefrom. Thus, the electrode contact **64** and main-body contact **77** do not contact each other. This position of the process cartridge **17** corresponds to the "retracted position" in the second embodiment.

Then the drawer frame **139** is moved leftward by the guide of the guide member **72** while the drawer frame **139** is being moved from the intermediate position to the mounted position. When the drawer frame **139** reaches the mounted position, the lower right end portion of the drawer frame **139** contacts the bent portion of the abutting member **71** (the portion at which the guide portion **72** and fixing portion **73** are connected to each other).

In this state, the electrode contact **64** of the process cartridge **117** is in contact with the right end portion of the main-body contact **77**. The process cartridge **117** is located at the advanced position, as shown in FIG. **7**B.

That is, the abutting member **71** moves the process cartridge **117** from the retracted position (FIG. **7**A) to the advanced position (**7**B) while accompanying movement of the drawer frame **139** in the up-down direction from the intermediate position to the mounted position.

This structure can serve to reduce occurrence of backlash between the drawer frame **139** and process cartridges **117**, as compared to a configuration in which the process cartridge **117** moves relative to the drawer frame **139**. This construction of the second embodiment can therefore ensure reliable contact between the electrode contact **64** of the process cartridge **117** and main-body contact **77** of the electrode unit **76**.

Further, the depicted structure of the second embodiment can obtain the similar operational and technical advantages as those of the first embodiment.

Incidentally, a plurality of (four) abutting members **71** is provided in the second embodiment. However, alternatively, only one abutting member **71** may be provided.

7. Third Embodiment

Next, a detailed construction of a drawer unit **212** according to a third embodiment of the present invention will be described with reference to FIGS. **8**A to **10**B. In the following description, like parts and components are designated by the same reference numerals with those of the first embodiment to avoid duplicating description.

The drawer unit **212** of the third embodiment includes a drawer frame **239** and four process cartridges **217** detachably supported in the drawer frame **239**.

In the drawer unit **12** of the first embodiment, the drawer frame **39** is provided with the biasing members **49**, and the main casing **2** is provided with the abutting members **71**.

In contrast, in the drawer unit **212** of the third embodiment, the drawer frame **239** does not have the biasing members **49**. Further, the abutting members **71** are not provided in the main casing **2**, as illustrated in FIG. **10**A.

Specifically, in the third embodiment, the main casing **2** is provided with a protrusion **85**, as shown in FIG. **8**A.

The protrusion **85** is disposed at a front end portion of the right surface of the left main-body side wall **70**L. That is, in the main casing **2**, the protrusion **85** is disposed most upstream in an attachment direction of the drawer frame **239**, i.e., in a direction orienting from the front to the rear. The protrusion **85** protrudes rightward from the right surface of the left main-body side wall **70**L. The protrusion **85** has a substantially trapezoidal shape in a plan view and is tapered toward the right with both front and rear end portions chamfered or truncated. The protrusion **85** is positioned lower than the electrode units **76** in the up-down direction in the left main-body side wall **70**L in order to prevent the protrusion **85** from interfering with the electrode retaining parts **61** of the process cartridges **217** during insertion of the drawer frame **239** into the main casing **2**.

Each of the process cartridges **217** has a casing **260** on which an interference portion **86** is disposed for providing abutment with the protrusion **85** provided on the left main-body side wall **70**L of the main casing **2**. Specifically, as shown in FIGS. **8**A and **8**B, the interference portion **86** protrudes leftward from a left surface of the casing **260**. The interference portion **86** has a substantially trapezoidal shape in a plan view and is tapered toward the left with both front and rear end portions chamfered or truncated. The interference portion **86** is positioned lower than the electrode retaining part **61** on the left surface of the casing **260** in the up-down direction. In FIGS. **10**A and **10**B, the protrusion **85** and interference portion **86** are not illustrated.

The process cartridges **217** are displaced leftward in the respective cartridge housing spaces **47** when mounted in the drawer frame **239** in the pulled-out position, as shown in FIG. **8**A. In other words, at this time, the process cartridges **217** are in the advanced position. The interference portion **86** is positioned leftward of the left side wall **40**L of the drawer frame **239** in the left-right direction, as shown by a broken line in FIG. **8**A.

Incidentally, the process cartridges **217** may be displaced rightward in the respective cartridge housing spaces **47** when mounted in the drawer frame **239** in the pulled-out position. That is, the process cartridges **217** may be placed in the retracted position. At this time, a left end portion of the interference portion **86** is substantially flush with the left side wall **40**L of the drawer frame **239** (refer to FIG. **8**B or **9**A).

Next, movement of the drawer frame **239** from the pulled-out position to the mounted position in the third embodiment will be described.

When the process cartridges **217** are in the advanced position, the interference portion **86** is positioned leftward of the left side wall **40**L, as shown in FIG. **8**A. Thus, when the drawer frame **239** supporting the process cartridges **217** in the advanced position is moved rearward from the pulled-out position toward the intermediate position, a rear end portion of the interference portion **86** of the rearmost process cartridge **217** is first brought into abutment with a front end portion (front-side slope) of the protrusion **85** as the drawer frame **239** enters into the main casing **2**. At this time, the electrode unit **76** provided in the left main-body side wall **70**L is not brought into abutment with the interference portion **86**, since the electrode unit **76** is positioned higher than the protrusion **85**.

In this way, the rearmost process cartridge **217** in the advanced position is pressed rightward by the front-side slope of the protrusion **85** in accordance with the rearward movement of the drawer frame **239**. The rearmost process cartridge **217** in the advanced position is therefore pushed to move rightward relative to the drawer frame **239** within the rearmost cartridge housing space **47**, thereby being moved to the retracted position. The rearmost process cartridge **217** is thus displaced rightward within the rearmost cartridge housing space **47** (see FIG. **8**B).

As a result, the left end portion of the interference portion **86** is made flush with the left surface of the left side wall **40**L. The interference portion **86** of the rearmost process cartridge **217** is now separated from the protrusion **85**.

In this way, as the drawer frame **239** moves rearward, the interference portions **86** of the four process cartridges **217**, all of which are in the advanced position, are sequentially brought into abutment with the protrusion **85**, thereby moving the process cartridges **217** sequentially from the advanced position to the retracted position. Thus, when the drawer frame **239** reaches the intermediate position, all the process cartridges **217** are placed at the retracted position, as shown in FIG. **9**A. In other words, the protrusion **85** achieves displacement of the process cartridges **217** from the advanced position to the retracted position during displacement of the drawer frame **239** from the pulled-out position to the intermediate position.

Put another way, the protrusion **85** displaces all the process cartridges **217** from the advanced position to the retracted position while the drawer frame **239** supporting the process cartridges **217** moves from the pulled-out position to the intermediate position.

Incidentally, in the example of FIG. **8**A, the process cartridges **217** are all in the advanced position. However, in case that all the process cartridges **217** are in the retracted position, the interference portions **86** of the process cartridges **217** move past the protrusion **85** on its right side without contacting the same.

Subsequently, the front cover **7** is moved from the opening position to the closing position after the drawer frame **239** reaches the intermediate position. The ascend/descend mechanism **15** thus moves the drawer frame **239** from the intermediate position (shown in FIG. **9**A) to the mounted position (shown in FIG. **10**A).

The main-body couplings **79** then advance leftward from the non-transmission position to reach the transmission position. The process cartridges **217** at the retracted position are thus pressed leftward by the corresponding main-body couplings **79** and are caused to move leftward (see FIG. **10**B).

As a result, as illustrated in FIGS. **9**B and **10**B, the process cartridges **217** are moved from the retracted position to the advanced position and the electrode contacts **64** are brought into contact with the right end portions of the corresponding main-body contacts **77**. That is, in the third embodiment, the main-body coupling **79** functions to move the process cartridge **217** from the retracted position to the advanced position when the drawer frame **239** is in the mounted position.

As described above, the protrusion **85** of the main casing **2** is configured to abut on the interference portions **86** of the process cartridges **217** in the advanced position while the drawer frame **239** is being moved from the pulled-out position to the intermediate position. All of the process cartridges **217** can be thus displaced from the advanced position to the retracted position.

This structure is effective in suppressing occurrence of sliding contact between the electrode contact **64** of the process cartridge **217** supported by the drawer frame **239** and main-body contact **77** of the electrode unit **76** during displacement of the drawer frame **239** from the pulled-out position to the intermediate position.

Further, as illustrated in FIG. **10**B, the main-body couplings **79** can move the corresponding process cartridges **217** supported by the drawer frame **239** in the mounted position from the retracted position to the advanced position in the left-right direction.

This means that the drawer frame **239** remains stationary with respect to the up-down direction while the process cartridges **217** are being moved from the retracted position to the advanced position. This structure can ensure reliable contact between the main-body contact **77** of the electrode unit **76** and electrode contact **64** of the process cartridge **217** in the left-right direction.

Further, advancing movement of the main-body couplings **79** from the non-transmission position to the transmission position causes the process cartridges **217** to move from the retracted position to the advanced position. That is, in the third embodiment, displacement of the process cartridges **217** from the retracted position to the advanced position is realized by a force generated upon connection of the main-body couplings **79** to the corresponding cartridge couplings **62** of the process cartridges **217**. This configuration eliminates the need to provide any additional member for moving the process cartridges **217** from the retracted position to the advanced position. A simplified configuration for moving the process cartridges **217** can be thus obtained in the depicted structure of the third embodiment.

The depicted structure of the third embodiment can also obtain the similar operational and technical advantages as those of the first embodiment.

8. Variations and Modifications

In the above-described first to third embodiments, the process cartridge **17** (**117**, **217**) is configured as a single unit including the photosensitive drum **18** and developing roller **20**. However, alternatively, the process cartridge **17** (**117**, **217**) may be configured of two units, i.e., a drum cartridge and a developing cartridge. In the latter case, the drum cartridge has the photosensitive drum **18**, while the developing cartridge has the developing roller **20** and is detachably attachable to the drum cartridge.

Still alternatively, the drawer frame **39** (**139**, **239**) may include the photosensitive drum **18**, and a developing cartridge having the developing roller **20** may be detachably attachable to the cartridge housing space **47** of the drawer frame **39** (**139**, **239**). In this case, the developing cartridge serves as an example of the claimed cartridge.

Still alternatively, only a toner cartridge storing toner may be detachably attached to the process cartridge **17** including the developing roller **20** and photosensitive drum **18**. In this case, the toner cartridge serves as an example of claimed cartridge.

In the above-described first to third embodiments, the developing roller **20** serves as an example of claimed processing body. However, one of the charging roller **19**, developing roller **20** and supply roller **21** may serve as an example of the claimed processing body.

With these configurations, the similar operational and technical advantages as those of the first embodiment can be obtained.

Each of the first through third embodiments and variations may be combined with one another appropriately.

While the invention has been described in detail with reference to the embodiments thereof, it would be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention.

What is claimed is:

1. An image forming apparatus comprising:

a main casing provided with a main-body electrode;

a cartridge including a processing body elongated in a first direction for image formation and a power-receiving part configured to contact the main-body electrode for receiving power therefrom and for supplying the power to the processing body;

a supporting member configured to support the cartridge therein, the supporting member being movable between a first position and a second position in a second direction generally perpendicular to the first direction, the supporting member at the first position being positioned outside the main casing and the supporting member at the second position being positioned inside the main casing; and

a first displacing mechanism configured to move the cartridge supported in the supporting member in the first direction to bring the power-receiving part into abutment contact with the main-body electrode.

2. The image forming apparatus as claimed in claim **1**, wherein the main casing includes a belt;

wherein the cartridge includes a photosensitive drum configured to contact the belt;

wherein the supporting member is further configured to move between the second position and a third position in a vertical direction perpendicular to the first direction and the second direction, the belt being separated from the photosensitive drum of the cartridge supported in the supporting member at the second position, the belt being in contact with the photosensitive drum of the cartridge supported in the supporting member at the third position; and

wherein the first displacing mechanism is configured to move the cartridge supported in the supporting member in the first direction to cause the power-receiving part to contact the main-body electrode along with movement of the supporting member from the second position to the third position.

3. The image forming apparatus as claimed in claim **2**, further comprising an ascend/descend mechanism configured to move the supporting member in the vertical direction between the second position and the third position.

4. The image forming apparatus as claimed in claim **2**, wherein the movement of the cartridge in the first direction to cause the power-receiving part to contact the main-body electrode by the first displacing mechanism accompanies movement of the supporting member in the first direction.

5. The image forming apparatus as claimed in claim **4**, wherein the first displacing mechanism is configured to move the supporting member in the first direction, the cartridge being immovable relative to the supporting member.

6. The image forming apparatus as claimed in claim **2**, wherein the first displacing mechanism is configured to move the cartridge in the first direction relative to the supporting member to cause the power-receiving part to contact the main-body electrode.

7. The image forming apparatus as claimed in claim **2**, wherein the main casing further includes an abutting member configured to abut on the cartridge while the supporting mem-

ber moves from the second position to the third position, the abutting member serving as the first displacing mechanism.

8. The image forming apparatus as claimed in claim **2**, further comprising a second displacing mechanism configured to move the cartridge in the first direction to cause the power-receiving part to separate from the main-body electrode along with movement of the supporting member from the third position to the second position.

9. The image forming apparatus as claimed in claim **8**, wherein the second displacing mechanism is provided in the supporting member.

10. The image forming apparatus as claimed in claim **8**, wherein the second displacing mechanism comprises a resilient member.

11. The image forming apparatus as claimed in claim **1**, wherein the main casing includes a belt;

wherein the cartridge includes a photosensitive drum configured to contact the belt;

wherein the supporting member is further configured to move between the second position and a third position in a vertical direction perpendicular to the first direction and the second direction, the belt being in separation from the photosensitive drum of the cartridge supported in the supporting member at the second position, the belt being in contact with the photosensitive drum of the cartridge supported in the supporting member at the third position; and

wherein the first displacing mechanism is configured to move the cartridge supported in the supporting member at the third position in the first direction to cause the power-receiving part to contact the main-body electrode.

12. The image forming apparatus as claimed in claim **11**, further comprising an ascend/descend mechanism configured to move the supporting member in the vertical direction between the second position and the third position.

13. The image forming apparatus as claimed in claim **11**, wherein the first displacing mechanism is configured to move the cartridge in the first direction relative to the supporting member to cause the power-receiving part to contact the main-body electrode.

14. The image forming apparatus as claimed in claim **11**, wherein the cartridge further includes a driving-force receiving part configured to receive driving force to be inputted to the processing body; and

wherein the main casing further includes a driving-force supplying part configured to supply the driving force to the driving-force receiving part, the driving-force supplying part functioning as the first displacing mechanism.

15. The image forming apparatus as claimed in claim **11**, further comprising a second displacing mechanism configured to move the cartridge in the first direction to cause the power-receiving part to separate from the main-body electrode while the supporting member moves from the first position to the second position.

16. The image forming apparatus as claimed in claim **15**, wherein the second displacing mechanism is provided in the main casing.

17. The image forming apparatus as claimed in claim **1**, wherein the first direction is perpendicular to a vertical direction.

18. The image forming apparatus as claimed in claim **17**, wherein the second direction is perpendicular to the vertical direction and the first direction.

19. An image forming apparatus comprising:

a main casing provided with a main-body electrode;

a cartridge including a developing roller extending in a first direction and a cartridge electrode configured to contact the main-body electrode and supply an electric power to the developing roller;

a drawer configured to support the cartridge, the drawer being movable between a first position and a second position in a second direction intersecting the first direction, the drawer at the first position being positioned outside the main casing and the drawer at the second position being positioned inside the main casing, the drawer being configured to move in the first direction to cause contact and separation of the cartridge electrode relative to the main-body electrode; and

a first displacing mechanism configured to displace the drawer in the first direction to cause the cartridge electrode to contact the main-body electrode.

20. The image forming apparatus as claimed in claim **19**, wherein the main casing includes a belt;

wherein the cartridge includes a photosensitive drum configured to contact the belt;

wherein the drawer is further configured to move between the second position and a third position in a vertical direction perpendicular to the first direction and the second direction, the belt being in separation from the photosensitive drum of the cartridge supported in the drawer at the second position, the belt being in contact with the photosensitive drum of the cartridge supported in the drawer at the third position; and

wherein the first displacing mechanism is configured to displace the drawer in the first direction to cause the cartridge electrode to contact the main-body electrode when the drawer moves from the second position to the third position.

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